

Hospital Nurses' Self-Reported Confidence in Their Telehealth Competencies

Cornelis T.M. van Houwelingen, PhD, RN; Roelof G.A. Ettema, PhD; Helianthe S.M. Kort, PhD; and Olle ten Cate, PhD

abstract

Background: The diffusion of telehealth into hospital care is still low, partially because of a lack of telehealth competence among nurses. In an earlier study, we reported on the knowledge, skills, and attitudes (KSAs) nurses require for the use of telehealth. The current study describes hospital nurses' confidence in possessing these telehealth KSAs. **Method:** In a cross-sectional study, we invited 3,543 nurses from three hospitals in the Netherlands to rate their self-confidence in 31 telehealth KSAs on a 5-point Likert scale, using an online questionnaire. **Results:** A total of 1,017 nurses responded to the survey. Nine KSAs were scored with a median value of 4.0, 19 KSAs with a median value of 3.0, and three KSAs with a median value of 2.0. **Conclusion:** Given that hospital nurses have self-confidence in only nine of the 31 essential telehealth KSAs, continuing education in additional KSAs is recommended to support nurses in gaining confidence in using telehealth. [*J Contin Educ Nurs.* 2019;50(1):26-34.]

Telehealth services are described as an important strategy and future direction for hospitals to, for example, reduce hospital readmission (Kripalani, Theobald, Anctil, & Vasilevskis, 2014). Telehealth is defined as providing health care remotely, instead of face-to-face, through the use of digital technology such as videoconferencing. Unfortunately, the diffusion of telehealth is still slow for a variety of reasons, including a lack of confidence among nurses in possessing essential telehealth competencies (Brewster, Mountain, Wessels, Kelly, & Hawley, 2014). Although training and education are often suggested as strategies to increase nurses' confidence

(Giordano, Clark, & Goodwin, 2011; Kort & van Hoof, 2012; Sharma & Clarke, 2014; van Houwelingen et al., 2015), little detail is provided about what content should be included in nursing telehealth continuing education programs (Brewster et al., 2014).

Dr. van Houwelingen is Postdoctoral Researcher, Research Group Technology for Healthcare Innovations, and Lecturer in Nursing and Clinical Health Sciences, University of Applied Sciences Utrecht and University Medical Center Utrecht, Dr. Ettema is Senior Researcher and Principal Lecturer, Research Group Chronic Diseases, University of Applied Sciences Utrecht and University Medical Center Utrecht, Dr. Kort is Full Professor, Technology for Healthcare Innovations, University of Applied Sciences Utrecht, and Dr. ten Cate is Full Professor of Medical Education, and Scientific Director of Education, Center for Research and Development of Education, University Medical Center Utrecht, Utrecht, The Netherlands.

© 2019 van Houwelingen, Ettema, Kort, et al.; licensee SLACK Incorporated. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (<https://creativecommons.org/licenses/by-nc/4.0>). This license allows users to copy and distribute, to remix, transform, and build upon the article non-commercially, provided the authors are attributed and the new work is non-commercial.

The authors thank Angeli Blankers, Ina Bruns, Manon Kraakman, Janke Schuurman, and Louise van Tilburg, students in Bachelor of Nursing, for their assistance during the validation process of the survey. They also thank the people who helped in the recruitment of participants: Hedwig Neefs, Senior Policy Advisor at the Association of Tertiary Medical Teaching Hospitals (Samenwerkende Topklinische Ziekenhuizen), Frans Klomp, Educationalist at the St. Antonius Hospital Academy, Petrie Roodbool, Full Professor in Nursing Sciences at the University Medical Center Groningen, and Harmieke van Os, researcher and Carien van Veelen, Cluster Manager at the University Medical Center Utrecht.

The authors have disclosed no potential conflicts of interest, financial or otherwise.

Address correspondence to Cornelis T.M. van Houwelingen, PhD, RN, Postdoctoral Researcher and Lecturer in Nursing and Clinical Health Sciences, Research Group Technology for Healthcare Innovations, University of Applied Sciences Utrecht, Heidelberglaan 7, Utrecht, The Netherlands; e-mail: thijs.vanhouwelingen@hu.nl.

*Received: November 6, 2017; Accepted: September 6, 2018
doi:10.3928/00220124-20190102-07*

To enhance hospital nurses' self-confidence in providing telehealth, they need to gain the appropriate competencies. This leads to the question "What competencies are necessary for nurses to use telehealth services?" This question was addressed in an earlier study (van Houwelingen, Moerman, Ettema, Kort, & ten Cate, 2016), in which 14 nursing telehealth care activities (e.g., providing health promotion remotely through videoconferencing) were identified. For each activity, a specific set of required knowledge, skills, and attitudes (KSAs) was determined. In that study, the authors concluded nurses require up to a total of 52 different KSAs, including generic KSAs such as clinical knowledge and specific telehealth KSAs such as the ability to put patients at ease when they feel insecure about using technology.

The 52 telehealth KSAs could serve to develop nursing telehealth care educational programs, which add to existing competencies. However, it is unknown how much confidence nurses already have in possessing these KSAs. The purpose of this article is to describe how hospital nurses self-rate their confidence in essential telehealth KSAs, summarized as telehealth care competence. This insight is needed for the development of nursing telehealth continuing education programs.

METHOD

Design

In a cross-sectional study in three hospitals in the Netherlands, a convenience sample of RNs was asked to rate their telehealth KSAs.

Setting and Population

Between October 2016 and March 2017, a total of 3,543 registered hospital nurses were asked to complete an online questionnaire (using SurveyMonkey™). No specific inclusion criteria were applied. All RNs in the Netherlands have completed senior secondary vocational nursing education or have a bachelor's degree in nursing education. The three hospitals that participated were located in the northern and central part of the Netherlands.

Survey Instrument

The survey began with seven sociodemographic questions: gender, age, educational degree, setting, inpatient or outpatient, experience with telehealth, and daily use of digital technology. Subsequently, a list of 31 telehealth KSA items followed, derived from van Houwelingen et al. (2016) (Table 1). For each item, participants were asked to rate their confidence in possessing that KSA (e.g., "I can communicate the benefits of telehealth technologies to patients") on a 5-point Likert scale, where 1 = *totally*

disagree, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *totally agree*.

Prior to data collection, validity evidence for the survey instrument was collected, following the guidelines by Artino, La Rochelle, Dezee, and Gehlbach (2014) for the development of educational research questionnaires. To assess the clarity and relevance of the KSAs in the survey, we interviewed three nurse specialist experts in telehealth who worked daily with the technology in the hospital setting.

As a result of the expert interviews, the number of KSA items in the survey was reduced from 52 to 31 by excluding the 21 KSAs that were mentioned by van Houwelingen et al. (2016) as generic competencies. We included only KSAs that were mentioned as subject-specific competencies, the 32 KSAs that "are specifically required for the provision of telehealth, and would not have been relevant without the emergence of telehealth" (van Houwelingen et al., 2016, p. 57). To ensure that our participants would interpret the questionnaire items in the manner we intended, hospital nurses were interviewed prior to survey administration to understand their interpretation. Based on these interviews, some KSA items were rephrased and two competency items were merged for a total of 31 telehealth KSAs in the survey.

To explore whether hospital nurses had additional thoughts regarding what should be included in continuing education in telehealth, the survey ended with one open-ended question: "Imagine that your organization will start or expand the use of telehealth. In addition to the 31 competencies in this survey, you may still identify other needs for training."

Handling Missing Data

To avoid selection bias caused by only including the participants who had completed the survey (Janssen et al., 2010), missing values for those participants who partially completed the survey were imputed. We used a multiple-imputation technique, including logistic and linear regression (the default method in SPSS®), to impute missing data. Janssen et al. (2010) showed that using the strict methodology of multiple imputation is a better alternative than excluding cases with missing values. The aim of using multiple imputation is "not to create data, but to prevent the exclusion of observed data" (Janssen et al., 2010, p. 721). By default, this method generates five imputed data sets. The statistics reported in the results section are pooled statistics from these five imputed data sets.

Data Analysis

Normal Distribution. The distribution of the data was explored visually using histograms and tested with Kolmogorov-Smirnov tests. Because the data were not

TABLE 1

HOSPITAL NURSES' (N = 1,017) SELF-REPORTED CONFIDENCE IN THEIR TELEHEALTH KNOWLEDGE, SKILLS, AND ATTITUDES^a

I Have Knowledge of...	Median (1st to 3rd Quartile)	Required for How Many Activities^b
1. the potential benefits of telehealth and social media.	4.0 (3.0-4.0)	2
2. how to collect health-related data for monitoring patients' health.	4.0 (3.0-4.0)	1
3. how telehealth can be deployed in existing pathways.	3.0 (2.0-3.8)	4
4. the limitations of telehealth in providing health care.	3.0 (2.0-3.6)	4
5. how technology can be used in sharing information with colleagues.	3.0 (2.0-4.0)	3
6. the laws and regulations concerning the protection and exchange of medical data (e.g., data protection, informed consent, confidentiality).	3.0 (2.0-4.0)	3
7. policies, procedures, and protocols of the organization concerning the deployment of telehealth technologies.	2.0 (2.0-3.0)	5
8. what to do if the technology does not work.	2.0 (2.0-3.0)	1
9. the procedure: what to do in case of an emergency during the use of telehealth.	2.0 (1.0-3.0)	5
Skills: I...		
1. have basic information technology (IT) skills, such as the use of the Internet and a personal computer.	4.0 (4.0-5.0)	3
2. am able to use electronic health records.	4.0 (3.4-5.0)	1
3. am able to check IT equipment for functionality.	4.0 (3.0-4.0)	3
4. have skills in the field of contemporary technologies.	4.0 (3.0-4.0)	2
5. protect the privacy of self and the patient by taking into account ethical, legal, and regulatory considerations during the use of telehealth technologies.	4.0 (3.0-4.0)	2
6. can train the patient in using IT equipment.	3.0 (3.0-4.0)	4
7. can combine my nursing knowledge and experience effectively when using telehealth technology and decision making.	3.0 (3.0-4.0)	7
8. can communicate the benefits of telehealth technologies to patients.	3.0 (2.7-4.0)	2
9. can assess whether telehealth technology is convenient for the patient (e.g., based on their cognitive ability, technological skills).	3.0 (2.4-4.0)	3
10. am able to create a confidential environment and a pleasant atmosphere in videoconferencing.	3.0 (3.0-4.0)	1
11. can put patients at ease when they feel insecure about using technology.	3.0 (3.0-4.0)	4
12. can assess the needs and preferences of the patient with respect to telehealth.	3.0 (2.0-4.0)	3
13. can assess the reliability of health information on the Internet; websites, and mobile applications and advise patients about these apps and sites. I can also advise patients on how to use medical record portals in a safe way.	3.0 (2.0-4.0)	1
14. am able to recognize (at a distance) the needs of the patient and determine the care situation.	3.0 (2.0-4.0)	7
15. can communicate clearly in videoconferencing and have knowledge of the key points (e.g., use of voice, light, background).	3.0 (2.0-4.0)	5
Attitudes: I...		
1. am open minded about using new innovations in IT.	4.0 (3.4-4.0)	1
2. use an ethically correct attitude during videoconferencing (honesty, confidentiality, personal and professional integrity).	4.0 (3.0-4.0)	8
3. can convey empathy through videoconferencing by facial expression and verbal communication.	3.2 (3.0-4.0)	6
4. encourage the use of electronic measurement devices for the collection of detailed patient information.	3.0 (3.0-4.0)	2
5. am able to promote a feeling of confidentiality and privacy in videoconferencing.	3.0 (3.0-4.0)	4
6. have confidence that telehealth technology is not difficult to use.	3.0 (3.0-4.0)	1
7. am able to convey confidence in the deployed technology to patients.	3.0 (3.0-4.0)	1

^a Measured on a 5-point scale, ranging from 1 = *totally disagree* to 5 = *totally agree*. Statistics were pooled from five imputed data sets. Items are arranged from high to low based on the median values and interquartile range within each category. The items were derived from van Houwelingen et al. (2016).

^b Van Houwelingen et al. (2016) described 14 nursing telehealth entrustable professional activities. Some of the knowledge, skills, and attitudes were required for several activities, and some for only one, which indicates the importance of the different knowledge, skills, and attitudes for practice.

normally distributed, we could not use means and standard deviations to report our results given that the mean does not represent the center in skewed data. Therefore, for each of the 31 KSAs, the median value and related interquartile range (IQR) were calculated.

Nonparametric Mann-Whitney U Tests. Furthermore, because the data were not normally distributed, we used nonparametric tests to explore differences. Aiming to obtain a deeper understanding of a possible selection bias, Mann-Whitney *U* tests were performed in two ways. First, differences in demographic characteristics were tested between (a) participants who only responded to the demographic questions (and did not respond to the KSAs items) and (b) participants who fully or partially completed the survey including the KSAs items. Second, differences in self-rating scores on “I’m open-minded about using new innovations in IT [information technology]” were tested between (a) participants who directly responded to the first e-mail invitation to join the survey, and (b) participants who joined the survey only after a reminder e-mail. This e-mail reminder included the phrasing “to increase the reliability of the survey, nurses who do not have an affinity for telehealth are also invited to join the survey.” All statistical data analyses were performed using SPSS (version 24.0).

Analysis of Responses to the Open-Ended Question. The responses to the open-ended question on the survey were analyzed in accordance with the suggestions of O’Cathain and Thomas (2004) on how to handle open-ended questions on a survey in two steps. First, all answers were coded. These initial codes were discussed among the authors to organize and group the codes into meaningful categories and topics. Second, we searched for illustrative examples. The coding and analysis was performed in MAXQDA (software for qualitative data analysis, version 12.2.1). The last phase of the data analysis examined whether those nurses who chose to answer the open-ended question differed from those who did not. These subgroups were compared using Mann-Whitney *U* tests on age, gender, educational status, experience with telehealth, and their self-rating scores on “I’m open-minded to use new innovations in IT.”

Ethics Approval

The Ethical Review Board of the Netherlands Association for Medical Education approved this study. All nurses participated voluntarily in the survey. Nurses were informed by a letter that they were free to decline to participate or to terminate participation at any time.

RESULTS

Sociodemographic Characteristics

Of the 3,543 nurses who were invited to participate, 1,040 nurses responded to the survey. Of these nurses, 23

were excluded because they responded only to the informed consent and not to any additional questions, leaving 1,017 participants.

Not all participants fully completed the survey. We compared the nurses who fully or partially completed the survey ($n = 729$) with those who responded only to the demographic questions ($n = 288$) and found slight but significant ($p < .05$) differences between these two subgroups in three of the demographic items. Participants who only responded to the demographic questions (a) more often worked in inpatient (versus outpatient) care, (b) more often had average education (less often high), and (c) made less use of Skype™ or FaceTime® in their daily lives.

Of the 45 items in the survey, 32 had one or more missing values. The percentage of missing values for each variable ranged from 0% to 28.3%. All missing values were imputed using a multiple imputation procedure. As a result, the findings presented in this article are based on 1,017 cases, which reflects a response rate of 29%.

Most participants were women (88.5%, $n = 900$) and the majority had a bachelor’s degree or higher (61.2%, $n = 622$). The median age of the participants was 41 years (IQR = 30-53). Approximately half of participants (49.4%, $n = 503$) had experience with using telehealth. This experience was assessed by a close-ended yes/no question; thus, no insight could be gained about the length of experience. Sociodemographic characteristics are listed in **Table 2**.

Self-Reported Confidence in Telehealth KSAs

Table 1 displays each of the required KSAs and the related self-rating scores. **Table 1** also displays the number of nursing telehealth activities for which each of the KSAs is required, indicating their relevance. These numbers are based on a prior study (van Houwelingen et al., 2016). Nurses had the most confidence in possessing basic IT skills, such as use of the Internet and a personal computer (median = 4.0, IQR = 4.0-5.0), and they had the least confidence in having knowledge of “the procedure: what to do in case of an emergency during the use of telehealth” (median = 2.0, IQR = 1.0-3.0).

Nurses’ Suggestions for Continuing Education in Telehealth

Of the 1,017 respondents, 132 left a response to the optional open-ended question “You may still identify other needs for training.” These 132 nurses were significantly older than the nurses who did not respond to the open-ended question (median age = 48.0 versus 40.0). We found no difference regarding gender, educational status, experience with telehealth, or nurses’ self-rating on “I’m open-minded to using new innovations in IT.”

TABLE 2
SOCIODEMOGRAPHIC CHARACTERISTICS AND TECHNOLOGY EXPERIENCE OF PARTICIPATING HOSPITAL NURSES (N = 1,017)

Characteristic	N	%
Gender		
Female	900	88.5
Male	117	11.5
Age group (years)		
≤30	276	27.1
31-40	221	21.7
41-50	181	17.8
51-60	273	26.8
>60	66	6.5
Highest completed educational level		
Low (lower secondary education)	18	1.8
Average (general or vocational upper secondary education)	377	37.1
High (bachelor's degree or higher)	622	61.2
Setting		
Mental health hospital unit	56	5.6
Nonpsychiatric hospital unit	961	94.4
Working inpatient/outpatient		
Inpatient	801	78.8
Outpatient	123	12.1
Both	93	9.1
Experience with telehealth ^a		
Yes	503	49.5
No	514	50.5
Daily use of technology ^b		
Smartphone	955	93.9
Tablet and/or iPad	541	53.2
Skype and/or FaceTime	40	3.9
Internet	986	97
E-mail	966	95
Computer/laptop	828	81.4

^a Experience with, for example, electronic health records, videoconferencing, telemonitoring, falls detection.

^b Participants were asked how often they used these six technologies in their daily life, which they answered on a 4-point scale ranging from 1 = *daily* to 4 = *hardly ever*. This table presents the frequencies of participants who responded *daily*.

The initial coding process of the responses to the open-ended question resulted in 160 coded text segments, which could be divided into five topics. The most prevalent topic (45% of all 160 text segments) was not directly related to the topic of the question (acquiring telehealth competencies) but concerned general statements about telehealth (e.g., “telehealth is a positive development,” “telehealth is

not applicable to our work,” or “telehealth is an undesirable development”).

The second most prevalent topic (29%) was directly related to the question and included all kinds of wishes, related needs, or suggestions related to continuing education in telehealth, which are discussed below. The other three topics concerned “(technical) feedback on the sur-

vey” (14%) (e.g., a word missing in one item), “statements on the importance of training” (9%) (e.g., “education is really important”), or “other” (3%) (“I’m retiring in a couple of months, so I didn’t get into this”).

Within the category of acquiring telehealth competencies, 16 different suggestions were identified. Five suggestions recurred in multiple answers, and the other 11 were mentioned only once ($n = 1$). The two most prevalent suggestions were (a) continuing education in the four examples of nursing telehealth activities that were given (Table 3) and (b) continuing education in the practical use of devices, attention to, for example, use, safety, and video communication. All 16 suggestions are listed in Table 3, along with a related comment from a participant.

DISCUSSION

Hospital nurses’ confidence in possessing essential telehealth care KSAs in nine of 31 items was *good* (median = 4.0 on a scale ranging from 1 to 5; e.g., “knowledge of the potential benefits of telehealth and social media”). In 19 KSAs, nurses had *moderate* confidence in possessing these (median = 3.0). Nurses appeared to have *low* confidence in three KSAs (median = 2.0; e.g., “knowledge of policies, procedures and protocols of the organization concerning the deployment of telehealth technologies”).

Integration With Prior Research

The current study illustrated nurses’ limited confidence in possessing the required telehealth KSAs, but the slow diffusion of telehealth services into hospital care also could be explained by other factors. According to national policy plans, funding for telehealth services in hospital care will be further realized and regulated from 2018 onward (Dutch Healthcare Authority, 2017). The limited (financial) possibilities of hospitals, until now, also might have limited nurses’ chances to gain experience with the use of telehealth. The introduction mentioned that nurses’ lack of telehealth competence can hamper the use of telehealth, but it also can work the other way around. The limited availability of telehealth services in hospitals eliminates the opportunity for nurses to have successful experiences, which could improve nurses’ self-confidence, according to the classic work of Bandura (1977).

In prior research conducted in Australia by Eley, Fallon, Soar, Buikstra, and Hegney (2008), the same general conclusion was drawn: nurses need additional education to improve their confidence in using IT. Eley et al. (2008) also studied nurses’ confidence in using IT, but with a focus solely on possessing technical IT skills such as ability to use spreadsheets, Windows®, Apple®, and touch screens. This study adds to that literature, as it not only measured nurses’ confidence in operating a certain

IT device, but subsequently whether they felt able to integrate this device into health care, for example, through the skill “able to create a confidential environment and a pleasant atmosphere in video conferencing.”

Carter, Hudyma, and Horrigan (2010) explored the educational needs in telepractice (i.e., the delivery of care provided via information and communication technologies) of nurses in Canada and mentioned that providers of telehealth education programs could include colleges, universities, nursing associations, telehealth organizations, or hospitals. For hospitals, the results of this study can be used as a starting point in the development of continuing education programs by considering which KSAs were scored as moderate or low (further discussed in the section Implications for Continuing Education).

Study Limitations

Using a cross-sectional survey design brings the risk of a biased response (Levin, 2006), where individuals with a certain set of characteristics are more likely to respond. This also might have applied to this survey, with a response rate of 29%. Therefore, we compared those who responded directly to the survey ($n = 665$) and those who only responded after a reminder e-mail was sent ($n = 353$) on their self-rating on “I’m open-minded about using new innovations in IT.” Nurses who responded only after the reminder e-mail appeared to be significantly ($p < .01$) less open-minded about using new innovations in IT. Therefore, it can be argued that the sample selection bias, due to the initial nonresponse, was decreased by sending the reminder e-mail, which might have encouraged nurses less open-minded to IT to complete the survey.

Another limitation concerns the generalizability of the study. The results can be generalized only to the three participating hospitals, but it is not known whether the confidence levels found apply to nurses in general. Furthermore, the open-ended question, “In addition to the 31 competencies in this survey, you may still identify other needs for training,” was answered by only 132 participants. Nonresponders ($n = 885$) may have thought that education on the 31 KSAs would be sufficient. The 132 participants who did respond reflected only 13% of the total study population. Moreover, the two suggestions that were most frequently mentioned, 13 and 12 times, respectively, represented 1.3% and 1.2% of all participants. Therefore, these examples might provide insight into how nurses can think of what components are essential for continuing education in telehealth, but they do not provide a reliable overview of what hospital nurses actually need for education. However, the results can provide a starting point for the design of continuing education programs.

TABLE 3

NURSES' SUGGESTIONS OF ADDITIONAL TOPICS TO BE INCLUDED IN CONTINUING EDUCATION IN TELEHEALTH

Suggested Topics to Be Covered	Comment	Frequency of Similar Comments
1. Training in the following activities: Analyzing and interpreting incoming data derived from (automatic) devices for self-measurement Providing health promotion remotely Instructing patients and family caregivers in self-care Guidance and peer consultation via videoconferencing	"I cannot think of any other additional components at this time." (participant 48, female, 31 years)	13
2. Use of (new) devices: use, safety, practical aspects	"I think it's a good way to communicate remotely. However, this requires clear agreements regarding the use and security, both for the patient and clinic." (participant 528, female, 58 years)	12
3. Providing health care remotely: for example, medication check, video communication	"I have no experience in working like this, but it seems to me a challenge to learn. I understand that some training is needed to master this way of communicating." (participant 949, female, 64 years)	6
4. Laws and regulations	"It's good to not only name the laws and legislation in protocols but also hear it during a training." (participant 71, female, 45 years)	2
5. Informing/explaining to patients about the use of telehealth	"That it [telehealth] will be useful for a particular group, I agree, but not everyone will be able yet to use it. In explaining remote technology, I need training." (participant 252, female, 53 years)	2
6. Good communication skills	"Advice on good communication/questioning about complaints." (participant 442, female, 27 years)	1
7. Decision making based on observations through video communication	"Making decisions based on video communication; when and how do you send someone and when can you make the decision yourself?" (participant 534, female, 45 years)	1
8. Follow-up care through video communication	"Video communication and/or remote monitoring, for example in follow-up care of patients, or family members of patients. Perhaps this threshold is lower than if you need to make an appointment." (participant 89, female, 51 years)	1
9. All options and possibilities	"I feel sorry if there are options that I do not discover and, therefore, do not use. There must be training courses for this purpose." (participant 425, female, 25 years)	1
10. Stimulating patients in the use of the electronic health record	"The electronic health record, where the patient can follow everything online. Train nurses how this works and how they can inform or stimulate the patient." (participant 589, female, 23 years)	1
11. Time to maximally benefit from the technology	"Time to use the technology optimally." (participant 545, female, 57 years)	1
12. The whole process	"I'm not very good with the latest IT gadgets, I would like to have training in the whole process." (participant 313, female, 31 years)	1
13. Good practice	"I think I only know what I cannot, if I start using it more, and then I know where I'm struggling with. Practicing beforehand seems desirable to me." (participant 316, female, 60 years)	1
14. Typing skills (keyboarding)	"Many colleagues cannot type quickly (especially the older colleagues). They never followed a typing course. I think it's crucial for them to process information quickly." (participant 425, female, 25 years)	1
15. Applicability of telehealth	"I would like to have explained the possibilities and applicability of this item [telehealth activities] (for me a fairly new area)." (participant 259, female, 50 years)	1
16. Developing a uniform way of using telehealth	"Training to develop a uniform way of working with each other and to be aware of the different protocols we use." (participant 584, female, 29 years)	1

TABLE 4

HIGHLY RECOMMENDED COMPONENTS FOR CONTINUING EDUCATION IN NURSING TELEHEALTH IN HOSPITALS

Essential Training Component	Based on ^a
1. Knowledge of policies, procedures, and protocols of the organization concerning the deployment of telehealth technologies	Low score + relevance
2. Knowledge of what to do if the technology does not work	Low score
3. Knowledge of the procedure: what to do in case of an emergency during the use of telehealth	Low score + relevance
4. Skills to combine clinical experience effectively with telehealth care technology in decision making	Medium score + relevance
5. Skills to be able to recognize (at a distance) the needs of the patient and care situation (empathy)	Medium score + relevance
6. Skills to communicate clearly in videoconferencing and know what to do to enhance contact (e.g., use of voice, light, background)	Medium score + relevance
7. Attitude: conveying empathy through videoconferencing by facial expressions and verbal communication	Medium score + relevance
8. Attitude: an ethically adequate attitude during videoconferencing (honesty, confidentiality, personal and professional integrity)	High relevance

^a Nurses ($N = 1,017$) expressed their confidence in possessing 31 different telehealth knowledge, skills, and attitudes (KSAs), on a scale from 1 (*lowest*) to 5 (*highest*). Low score: median of 2.0; medium score: median of 3.0. The KSAs are required for a different amount of nursing telehealth activities, which indicates their relevance for practice (van Houwelingen et al., 2016). Relevance indicates: required for at least five different nursing telehealth activities. High relevance indicates: required for eight nursing telehealth care activities.

Implications for Continuing Education and Staff Development

A positive self-perception of competence is associated with behavioral change (Bandura, 1977). This also applies to the context of nursing telehealth; more confidence in telehealth competence is positively associated with nurses' willingness to use telehealth services (Lam, Nguyen, Lowe, Nagarajan, & Lincoln, 2014; van Houwelingen et al., 2015). Hence, the results of this study can be used for the development of continuing education programs aimed at increasing nurses' willingness to use telehealth services.

In an earlier study (van Houwelingen et al., 2016), all 31 telehealth care KSAs of the survey were considered relevant to nursing practice. However, it was unclear whether all of these 31 KSAs should be included in continuing education in nursing telehealth. The current study revealed that hospital nurses' confidence in 22 of the 31 KSAs was moderate or low (**Table 1**). Therefore, these 22 KSAs can be considered relevant to be included in continuing education in nursing telehealth. However, one also could argue that including the competencies that nurses already possess in education could bolster their confidence, given that it could make them aware of what they already know and can do.

When hospitals seek to further narrow down components in their continuing education in telehealth, they could exclude some of the KSAs based on the frequency of nursing telehealth activities for which they are required. For example, in final recommendations for staff development (**Table 4**), only those KSAs that

are required for at least four different nursing telehealth activities (according to van Houwelingen et al., 2016) were included. Seven of these KSAs were scored with a median of 2.0 or 3.0, and one attitude was scored with a median value of 4.0 (IQR = 3.0–4.0): “An ethically correct attitude during videoconferencing (honesty, confidentiality, personal and professional integrity).” Although the majority of the study population appeared to have good confidence in possessing this attitude, education for hospital nurses in this attitude is recommended, as this element is required for eight different activities. **Table 4** presents eight highly recommended components to include in continuing education in telehealth, based on results from this study and those from prior research (van Houwelingen et al., 2016).

Table 4 provides insight into the KSAs in which nurses should gain more confidence via continuing education. When thinking of how to deliver continuing education in telehealth, Bandura's (1977) strategies to increase self-confidence might be useful. Hospital nurses' telehealth confidence might increase when they have successful experiences (performance accomplishments). Another possibility for continuing education is to have nurses learn by observing role models (vicarious experience) in clinical practice, such as those who have experience in telehealth services. During continuing education, educators can encourage participants to share experiences in using telehealth services. Positive experiences of significant others, such as colleagues, also might help nurses in gaining self-confidence in their own telehealth competence.

Although facilitating training courses in telehealth can accelerate the process of acquiring competence, several other strategies exist for continuing professional development, among which is a deliberate and thoughtful use of clinical experience (Pool, Poell, Berings, & ten Cate, 2015). As a type of sensitivity analysis, the confidence levels of the nurses of this sample with ($n = 503$) and without telehealth experience ($n = 514$) were compared. Nurses with telehealth experience reported significantly higher ($p < .01$) confidence levels for telehealth KSAs, indicating that experience is also an important factor to gain competence.

CONCLUSION

Continuing education is considered a useful strategy to support nurses in gaining telehealth competence. When hospitals consider increasing nurses' confidence in telehealth competence, they should be aware that the majority of the nurses in this study already had self-confidence in nine of the 31 required telehealth care KSAs. At the same time, nurses' confidence in 19 of the 31 KSAs was moderate or low, and continuing education in additional KSAs for telehealth is highly recommended. The current study revealed eight KSAs are recommended for inclusion in continuing education programs in nursing telehealth. Education in these essential telehealth KSAs might support hospital nurses in using telehealth services and contribute to increasing the diffusion of telehealth services into hospitals.

REFERENCES

Artino, A.R.J., La Rochelle, J.S., Dezee, K.J., & Gehlbach, H. (2014). Developing questionnaires for educational research: AMEE guide no. 87. *Medical Teacher*, *36*, 463-474. doi:10.3109/0142159X.2014.889814

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215. doi:10.1016/0146-6402(78)90002-4

Brewster, L., Mountain, G., Wessels, B., Kelly, C., & Hawley, M. (2014). Factors affecting front line staff acceptance of telehealth technologies: A mixed-method systematic review. *Journal of Advanced Nursing*, *70*, 21-33.

Carter, L., Hudyma, S., & Horrigan, J. (2010). Investigating the educational needs of nurses in telepractice: A descriptive exploratory study. *Canadian Journal of University Continuing Education*, *36*, 1-20. doi:10.21225/D5RP4B

Dutch Healthcare Authority [Nederlandse Zorgautoriteit]. (2017). *Dutch healthcare authority extends the possibilities for e-health in medical specialist care from 2018 onwards [NZA verruimt mogelijkheden voor e-health in de medisch-specialistische zorg per 2018]*. Retrieved from <https://www.nza.nl/publicaties/nieuws/NZA-verruimt-mogelijkheden-voor-e-health-in-de-medisch-specialistische-zorg-per-2018/>

Eley, R., Fallon, T., Soar, J., Buikstra, E., & Hegney, D. (2008). Nurses' confidence and experience in using information technology. *Australian Journal of Advanced Nursing*, *25*(3), 23-35.

Giordano, R., Clark, M., & Goodwin, N. (2011). *Perspectives on telehealth and telecare: Learning from the 12 whole system demonstrator action network (WSDAN) sites*. Retrieved from <http://www.kingsfund.org.uk/sites/files/kf/Perspectives-telehealth-telecare-wsdan-paper.pdf>

Janssen, K.J., Donders, A.R.T., Harrell, F.E., Vergouwe, Y., Chen, Q., Grobbee, D.E., & Moons, K.G. (2010). Missing covariate data in medical research: To impute is better than to ignore. *Journal of Clinical Epidemiology*, *63*, 721-727. doi:10.1016/j.jclinepi.2009.12.008

Kort, H.S.M., & van Hoof, J. (2012). Telehomecare in the Netherlands: Barriers to implementation. *International Journal of Ambient Computing and Intelligence*, *4*(2), 64-73. doi:10.4018/jaci.2012040105

Kripalani, S., Theobald, C.N., Anctil, B., & Vasilevskis, E.E. (2014). Reducing hospital readmission rates: Current strategies and future directions. *Annual Review of Medicine*, *65*, 471-485. doi:10.1146/annurev-med-022613-090415

Lam, M.K., Nguyen, M., Lowe, R., Nagarajan, S.V., & Lincoln, M. (2014). "I can do it": Does confidence and perceived ability in learning new ICT skills predict pre-service health professionals' attitude towards engaging in e-healthcare? *Studies in Health Technology and Informatics*, *204*, 60-66.

Levin, K.A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, *7*, 24-25. doi:10.1038/sj.ebd.6400375

O'Cathain, A., & Thomas, K.J. (2004). "Any other comments?" open questions on questionnaires—A bane or a bonus to research? *BMC Medical Research Methodology*, *4*, 25. doi:10.1186/1471-2288-4-25

Pool, I.A., Poell, R.F., Berings, M.G., & ten Cate, O. (2015). Strategies for continuing professional development among younger, middle-aged, and older nurses: A biographical approach. *International Journal of Nursing Studies*, *52*, 939-950. doi:10.1016/j.ijnurstu.2015.02.004

Sharma, U., & Clarke, M. (2014). Nurses' and community support workers' experience of telehealth: A longitudinal case study. *BMC Health Services Research*, *14*, 1-7. doi:10.1186/1472-6963-14-164

van Houwelingen, C.T.M., Barakat, A., Best, R., Boot, W.R., Charness, N., & Kort, H.S.M. (2015). Dutch nurses' willingness to use home telehealth: Implications for practice and education. *Journal of Gerontological Nursing*, *41*, 47-56. doi:10.3928/00989134-20141203-01

van Houwelingen, C.T.M., Moerman, A.M.H., Ettema, R.G.A., Kort, H.S.M., & ten Cate, O. (2016). Competencies required for nursing telehealth activities: A delphi study. *Nurse Education Today*, *39*(4), 50-62. doi:10.1016/j.nedt.2015.12.025